FOREST PEST MANAGEMENT
Pacific Southwest Region

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BIOLOGICAL EVALUATION OF HANNA FLAT, BIG BEAR RANGER DISTRICT, SAN BERNARDINO NATIONAL FOREST

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ABSTRACT

An evaluation of the pest situation, specifically dwarf mistletoe, at Hanna Flat, Big Bear Ranger District was completed. Western dwarf mistletoe was observed in Jeffrey pine in various areas on the Flat. Two situations exist on the Flat. Two areas have been cleared of infected pine and have been or will be regenerated with Jeffrey pine. There are still infected trees around the borders of the plantations -- left because of visual quality objectives or inaccesibility -- that threaten the regeneration. Three alternatives, no action, create a buffer, and treat adjacent stands, are discussed. The bulk of the Flat has not had any treatment and has varying levels of dwarf mistletoe infestation. Several alternative treatment methods are presented and discussed. These include no action and treat stands. Finally, Forest Pest Management funding that is available for dwarf mistletoe suppression is discussed.

INTRODUCTION

At the request of Charles Irby, Acting Forest Supervisor, we examined Hanna Flat (T.2N, R.1W, sections 2, 3, and 4; see Map) on the Big Bear Ranger District on October 30-31, 1984. We were accompanied by Randy Scott, Resource Officer, and Katie Clifford, Forester Trainee, from the District.

The area of concern encompasses around 500 acres. A heavily-used road transects the length of the Flat and both visual quality and recreation goals are paramount. To satisfy these goals, the District is attempting to promote the health and vigor of the vegetation and to retain tree cover where necessary. A major constraint on these vegetation objectives is the presence of western dwarf mistletoe (Arceuthobium campylopodum) in the Jeffrey pine in various stands in the Flat.

The majority of the tree population consists of Jeffrey pine. A few scattered white firs are in the overstory and are providing seed for an increased number of this species in the understory. California black oaks also make up a proportion of the stands. Medium-size sawtimber comprises most of the overstory and all sizes up to small sawtimber can be found in the understory.

Two areas on the Flat have recently had some management activities. In 1983, an 8-acre area was treated to remove all dwarf mistletoe-infected Jeffrey pines. The area was planted with Jeffrey pine in 1984. A 30-acre area was similarly harvested in 1984 with regeneration scheduled for 1985. Dwarf mistletoe-infected Jeffrey pines remain around parts of both of these areas either because of visual requirements or lack of accessibility.

The primary questions from the District were as follows.

1. How can we protect the regenerated areas from infection by dwarf mistletoe in surrounding trees?

2. How can we promote the health of the undisturbed stands that are infected by dwarf mistletoe?

3. How can we manage the infestation in constrained areas, such as along the transportation corridor?

4. What funding may be available from Forest Pest Management to deal with these situations?

BIOLOGY OF WESTERN DWARF MISTLETOE

Western dwarf mistletoe (Arceuthobium campylopodum) is an obligate parasite, requiring living host tissue to survive. Jeffrey, ponderosa, and Coulter pines are its principal hosts. These hosts provide the dwarf mistletoe plants with support, water, minerals, and nutrients.

Female dwarf mistletoe plants develop seed in fruit capsules in late summer to early autumn. These seed are forcibly ejected when ripe and spread both vertically and horizontally. If successful in landing and sticking on a needle and subsequently sliding down to the twig of a host plant, the germinating seed will penetrate the twig the next spring, establish a "root system" that interfaces with the vascular system of the host, and begin to parasitize the host. In 2 to 3 years, shoots will develop. Flowering and fruit production occurs in another 2 to 3 years.

Dispersal of dwarf mistletoe is primarily through forcible ejection of seed. Horizontal dispersal distance can equal the height of the mistletoe plant in the tree, although it is usually less. In a normal, even-aged pine stand, horizontal spread averages 1 to 2 feet per year over time. Upward spread is much less, 4-6 inches, because of the increased chance of interception by needles.

Dwarf mistletoes are most readily recognized by the yellow plants growing from branches. Other indicators are swollen branches, witches' broom, and basal cups which are remnants of shoots on branches.

MANAGEMENT ALTERNATIVES

Two different sets of management alternatives were developed to address the two situations at Hanna Flat.

Regenerated Areas

1. No Action. As the Jeffrey pine regeneration increases in size, the probability of infection by dwarf mistletoe from surrounding trees will increase substantially. This deposition of seeds from above will insure that the entire crowns of the regeneration will become infected. This will result in retarded height growth, deformation, and mortality of the trees. It usually takes about 10 years before infection of regeneration takes place. Over time, infections from the edges will spread into the plantations and involve more trees. Larger trees will experience some growth reduction and increased susceptibility to successful attack by other pests, most notably bark beetles. In addition to infections from trees on the edges, some of the trees that were left in the plantations because of the lack of visible infection may have latent infections and could be sources of seed within the plantations.

2. Create a Buffer. Removal of infected trees from the perimeters of the plantations would decrease the risk of spread of dwarf mistletoe into the regeneration. Ideally, all host trees within 75-100 feet of the plantation boundaries should be removed or killed. If there is need to leave some trees, then, following close examination, those without visible infections could be retained. These residual trees should be reexamined in 2 to 3 years for any previously undetected infections and treated if necessary. In time, these leave trees could serve as avenues for infection into the plantation from beyond the buffer strip. In certain situations where there are a few lightly infected trees that must be retained, they may be pruned of all branches up to 2 whorls above the highest infected branch. At least 30% live crown must be retained. This should be limited to very special situations because of the difficulty of removing all infections by pruning. Buffer strips could be regenerated with non-host species, however, the only such species likely to survive over a long period under the conditions that exist is California black oak.

In addition to a pathogen-free buffer, all residual Jeffrey pines within the plantations must be examined closely in 2-3 and 5-6 years to insure that no infections were missed during the initial examination. Any previously undetected infections must be adequately treated to protect the plantations.

3. Treat Adjacent Stands. Rather than treating a buffer strip along part of the boundary of the plantation, an entire stand could be treated for dwarf mistletoe. This would involve removing or killing all dwarf mistletoe-infected trees in the stand, followed by regeneration. This would result in an expansion of the present plantation sizes, but could better utilize noninfected areas as stand boundaries. This would reduce the risk of infecting plantations from the edges.

Undisturbed Areas

1. No Action. The presence and level of infection varies throughout the Flat. With time, dwarf mistletoe will spread into uninfested stands and intensify throughout the area. This spread will result in increased stress on trees, some of which are already stressed by overstocking. As the dwarf mistletoe intensifies in the various stands, the probability of successful attack by bark beetles, especially the Jeffrey pine beetle (Dendroctonus jeffreyi), will increase. The greatest risk is to heavily infected trees, especially during a drought, or to those that are in overstocked stands. Natural pine regeneration in infested stands will also be adversely affected as they are constantly exposed to infection from the overstory. This will limit their future as replacement trees in the overstory.

The white firs in the understory will slowly increase in size and may enter the overstory as some of the pine die. Clumps of sapling- and pole-sized white firs around mature Jeffrey pines may increase the risk of bark beetle attacks to the pines because of the fir's propensity to continue to transpire even when soil moisture is low. Data from the San Bernardino Mountains indicates that these same white firs, when they reach small sawtimber size, are very susceptible to top-killing and mortality from the fir engraver (Scolytus ventralis) and fir flatheaded borer (Melanophila drummondi). Other pests, such as true mistletoe (Phoradendron bolleanum spp. pauciflorum) and annosus root disease (Fomes annosus), can aggravate this situation.

2. Treat Stands. The objective of this alternative is to minimize the effects of dwarf mistletoe by limiting its spread and reducing its intensity. Prior to any suppression action, a pre-suppression survey should be done to delineate non-infested areas and levels of infestation. Heavily-infested aggregates would be best treated through patch cuts that removed all infected trees. This would usually be a small clearcut that would be regenerated. Depending on the number, sizes, and locations of these cuts, they could be put in over time to minimize any visual impacts and to provide a more balanced workload.

Areas with light to moderate infection levels could be treated by removing the more heavily-infected trees. This would remove the trees with the highest probability of bark beetle attacks, as well as aid in reducing stocking levels. In areas where visual or other special requirements exist, some pruning may be appropriate. This may be accomplished in one of two ways, depending on the objective. Where trees are lightly infected in the lower crown, pruning to remove infected branches up to and including 2 whorls above the highest infection may eliminate dwarf mistletoe from that tree. Where this

type of pruning would reduce the live crown ratio below 30%, then broom pruning may be more appropriate. This technique is designed to prolong the lives of individual trees by removing witches' brooms caused by dwarf mistletoe. These brooms are the biggest nutrient drain on the tree. It would be an appropriate action for some trees along the transportation corridor so that much of the vegetation could be retained. It might also be appropriate for any large monarch trees in the stand that the District might want to retain.

FPM Funding

Annually, Forest Pest Management has had funding available that is specifically earmarked for dwarf mistletoe suppression on National Forest lands. These dollars are available for approved projects when other funding, such as K-V and P&M, is not available or is inadequate. Certain actions are required, most of which deal with fulfilling NEPA requirements, to obtain approval and funding. An environmental assessment and economic evaluation need to be completed and a Forest Pest Management Project Proposal, Form FS 3400-2, must be submitted. A presuppression survey may be necessary to gather the necessary data to complete the above. The FPM Staff will aid the District in the preparation of the necessary documents at their request.

Two other pests, annosus root disease and pine engraver beetles, are a constant hazard to pine stands on the District and can be aggravated by activities during stand management. However, measures are available that can be applied to mitigate the effects of these pests.

Annosus Root Disease Prevention. The most effective control for annosus root disease (Fomes annosus) is prevention. The usual avenue of introduction of the fungus into managed pine stands is through infection of freshly cut stumps by air-borne spores. An application of borax (sodium tetraborate decahydrate, EPA Reg. 1624-94) immediately after felling a conifer will prevent most infections from occurring (see FSM 2305, 2331.33 R-5 Supplement No. 90).

Pine Engraver Beetle Management. Pine engraver beetles (Ips spp.) can kill the tops of pines, as well as entire trees, if populations increase sufficiently. These insects normally breed in fresh slash and windthrown pines during the late spring and summer. Providing green slash from the winter through early summer can result in population increases of these insects. If additional green slash is not available in late summer when the beetles emerge, the adults may attack nearby standing trees causing top-killing and mortality. The most effective method of preventing damage from these insects is by reducing the amount of available green slash during the spring and early summer. Two means are available to accomplish this. Limiting stand management activities to late summer through early winter (late July through December) will limit the amount of suitable slash the following spring. If seasonal limits cannot be followed, then physically altering the suitability of any slash within a few weeks after cutting may be necessary. This can be accomplished by piling and burning, crushing with a tractor, lopping and scattering in open areas or tightly covering piles with clear plastic in openings. Any one of these treatments must be done soon after cutting while the slash is still green.

HANNA FLAT DWARF MISTLETOE AREA